

P Velocity Heterogeneities in the Upper Mantle beneath the Northwestern Pacific

*Nozomu Takeuchi¹, Hitoshi Kawakatsu¹, Hajime Shiobara¹, Takehi Isse¹, Hiroko Sugioka², Aki Ito³, Hisashi Utada¹

1. Earthquake Research Institute, University of Tokyo, 2. Kobe University, 3. JAMSTEC

We previously conducted waveform inversion of P waveforms recorded by our BroadBand Ocean Bottom Seismometers (BBOBSs) deployed in the Northwestern Pacific. We could reveal the depth profile of the P velocity of the oceanic upper mantle, which has not been well resolved by previous surface wave or receiver function analysis. The resulting P model shows higher and lower velocities in the lithosphere and the asthenosphere, respectively, and the velocity contrast was approximately 2/3 of that in the previous S models. However, the observed waveforms appear to show regional variations, and the validity to discuss using 1-D models was not very clear.

In this study, we investigated to reveal regional variations of P structures within the Northwestern Pacific. We defined two data bins so that the raypaths belonging to each bin sample similar regions with similar azimuths. The observed waveforms of each bin are coherent, which shows plausibility to compare obtained 1-D models. The preliminary results showed significant differences both in the lithosphere and the asthenosphere. The observed differences in the lithosphere (~4%) are consistent to the azimuthal anisotropy in the uppermost mantle reported by previous exploration studies. However, the differences in the asthenosphere (~2%) are unlikely to be explained by azimuthal anisotropy by olivine LPO because the angles to the plate motion direction are similar. This may suggest some mechanism to produce larger-scale (~1000 km) lateral heterogeneities in the asthenosphere.

Keywords: seismology, mantle, lithosphere, asthenosphere